Review of "Why models perform differently on particulate matter over East Asia? – A multi-model intercomparison study for MICS-Asia III" by Tan et al.

I thank the authors for revising their manuscript in response to my comments. However, the authors did not address all the comments adequately as explained below.

Response: We appreciate the reviewer's kindness in reviewing the manuscript and providing the valuable comments. Following are the point-to-point responses to the comments.

For example, in response to my comment on "Why would natural emissions affect BC concentrations and CO loading?", the authors state that same anthropogenic and natural emissions were used for each modeling system. But natural emissions cannot be same as they are calculated online in most of the models and some of the participating models do not even turn on the natural emissions.

Response: Thank you for pointing out this question.
The sea-salt and dust emissions were not prescribed. Modelling groups used their own sea-salt and dust emissions produced by the modules in the models. The emission group of MICS-Asia III prepared the biogenic emissions with Model of Emissions of Gases and Aerosols from Nature (MEGAN), biomass burning emissions with Global Fire Emissions Database (GFED), volcanic SO_2 emission from AEROCOM program (https://aerocom.met.no/ DATA/download/emissions/AEROCOM_HC/volc).

We made the following changes in the manuscript:
Line 110-112: "All modelling groups are required to use the prescribed anthropogenic emissions and natural inputs (including biogenic emissions, biomass burning emissions and volcanic SO_2 emissions. Dust and sea-salt emissions are produced by the corresponding modules in the models)."

I also asked to clarify "why sea-salt emissions were turned off in M7 and M8?". In their response, the authors say they confirmed that sea-salt emissions were turned off (which was clear in the previous version) but did not give a reason to turn them off. Please clarify.

Response: Model results of M7 and M8 were submitted by two different participating modelling groups of MICS-Asia III. They turned off the sea-salt emissions by mistake.

Uncertainty in Gas-particle conversion is suggested as the main reason for inter-model differences. Are the differences due to differences in tropospheric ozone and thus simulated OH or are the parameterization converting sulfuric acid to sulfate are different?

Response: Yes, both two factors could affect the gas-particle conversion. We added the following discussion in the manuscript:

Lines 428-431: "Besides the inter-model differences in the pathways of SO_4^{2-} and NO_3^- formation, the abundance of oxidants (i.e. OH radical) also affects the gas-aerosol conversion of S and N. In addition, the conversion between sulfuric acid and SO_4^{2-} depends on the abundance of neutralizers such as Na^+ and NH_4^+."

In addition, I have the following minor comments.

Line 31: Change "one the" to "one of the"

Response: We have changed it in the manuscript.

Line 122: Change Sector 2.1 to "Section 2.1".

Response: We have changed it in the manuscript.

Line 154: Should not Japan and Korea classify eastern EA?

Response: It is a typo. Japan and Korea are classified in eastern EA in the analysis. We have changed it and checked the manuscript to be consistent.

Lines 176-188: Can you please provide some quantitative information like by how much SO_4 is overestimated and NO_3 is underestimated. Same information for other species and AOD.

Response: We added the following sentences in the manuscript:

Line 180-183: "the differences between MMM and observation/satellite data for the surface concentrations of PM_{10}, $PM_{2.5}$, SO_4^{2-}, NO_3^- and NH_4^+, and column integrated aerosol optical depth (AOD) were -32.6%, 4.4%, -19.1%, 4.9%, 14.0% and 18.7%, respectively (calculated with normalized mean biases (NMBs))."

Lines 389-404: I am puzzled by this discussion. It is not clear to me how lower values of washout ratio lead to large biases in M11. I think showing the spatial distribution of Cdepo will be more useful than showing the washout ratios.

Response: The amount of deposition (C_{depo}) is determined by the surface concentration of air pollutants ($C_{surface\_air}$) and the washout ratio (also called scavenging efficiency,

determined by the model mechanism in producing wet deposition). Thus, inter-model differences in direct model outputs of C_{depo} may be partial influenced by different model inputs, caused by mismatch occurred in vertical and temporal allocation of emission inputs and employment of different mechanisms to produce dust and sea-salt emissions. To avoid such impacts, we used the washout ratio, calculated as a ratio of C_{depo} to $C_{surface\_air}$, as an indicator to reveal the inter-model differences caused by model mechanisms.